

THE ENTOMOLOGY OF THE GULF OF
CALIFORNIA *

Costly expeditions are sent to the most remote regions of the world in search of scientific treasures, but we do not always realize how much may still be done in North America, with relatively small expenditures of time or money. The Gulf of California Expedition was in the field about three months with a personnel of nine, and it is not too much to say that the results achieved are epoch-making in relation to the natural history of the region. The life of the gulf islands, in particular, has been elucidated in a way never before possible. The present notice is concerned only with the insects and other terrestrial arthropods, so far as reported on. Much of the material still awaits study, but the published accounts enumerate about 950 species, of which 420 species or races were new to science. We may estimate that the total of the new forms, when all have been gone over, will not fall short of 600, and may run to 700. This omits all reference to the fine collection of plants, already described, the very important series of mollusca, etc., all obtained by the expedition. However, all this successful effort would have been of comparatively little value had it not been possible to have the specimens studied and the numerous resulting papers published. The Academy is to be congratulated on the excellent appearance and promptness of its reports, so that already the principal results are available to the scientific world.

It is, of course, true of such work as this, that it raises a number of interesting questions which must eventually be answered, if at all, through further research. There are reasons for thinking that the southern end of the peninsula was formerly a large island; also that the islands of the southern portion of the gulf are older (as islands) than those north of the latitude of Guaymas. The problem of the smaller islands is particularly fascinating, as it may eventually be possible to use their biota to determine the rate of evolution of species in

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different groups. Thus we find that there are undoubtedly endemic forms of reptiles and snails on these islands, but it is questioned whether there are any truly endemic flowering plants. With regard to the arthropods, we can only say that many species are known from these islands, but whether they are all or mostly peculiar to them cannot be stated on the basis of present knowledge. It can hardly be without significance that all the six kinds of bees found on San José Island were new, and of 16 from Angel de la Guarda Island 12 were new. Of 18 bees from Tiburon Island, 10 were new, but of 41 from Guaymas only 19 were new. However, Angel de la Guarda Island, which produced such a large proportion of new bees, gave 12 old and 7 new spiders, and 5 old and 2 new Tenebrionids. The places which gave more new spiders than old were San Pedro Bay, San Carlos Bay, San Esteban Island, San Evaristo Bay, Puerto Escondido, San Luis Island, Tortuga Island, San Marcos Island, Santa Catalina Island, Los Galleras Island, San José Island, and Ceralbo Island. The places which produced more new Tenebrionids than old were Tepoca Bay, Guaymas, San Esteban Island, Angeles Bay, Gonzales Bay, San Nicolas Bay, Puerto Escondido, La Paz, San Luis Island, San Marcos Island, Santa Inez Island, Ildefonso Island, Coronado Island, Santa Catalina Island, San Diego Island, and Espirito Santo Island. There is thus no very clear evidence of endemism apparent on comparing the results from different groups of arthropods. In the Madeira Islands I have observed a remarkable development of slightly modified but quite distinguishable insular forms among the Tenebrionidæ and Carabidæ, some of them on very small islets. It can hardly be doubted that analogous phenomena occur elsewhere.

The Diptera of the expedition, elaborated by Messrs. Cole, Malloch and M. C. Van Duzee, show a number of interesting features. Several forms still await examination, but enough has been done to show the great preponderance of Bombyliidæ: 73 species, of which 28 were new. Only 27 new Diptera were found among all the other families combined, so far as studied. This abundance of Bombyliidæ is noteworthy because in Miocene times, as shown by the Florissant deposits, this family appears to have been dominant and varied, taking the place, as parasites, of the Tachinidæ, which do not appear in the Floris-

sant beds at all. I do not mean to suggest that there were no Tachinidæ in those days, but only that they were, at any rate, rare or absent in North America. It must be remarked, however, that the Lower California Bombyliidæ are disappointing, in that they include hardly any of those rare and isolated genera which are closely related to a great series of extinct genera present in the Miocene rocks. I had strong hopes that the expedition would discover one or more of the Miocene genera in a living state, but nothing of the kind appeared. Instead of that the list includes no less than thirty-five forms of *Villa* (*Anthrax*), belonging to a section of the Bombyliidæ apparently quite absent from the Florissant shales. In several of the papers attention is called to species which belong to genera or groups elsewhere known only from remote parts of the world. Undoubtedly, the Lower California Peninsula and adjacent islands are more likely than most regions to exhibit these relic species, and it may be anticipated that more intensive collecting at various seasons of the year will bring to light a number of ancient survivors from an earlier epoch. The land shells are especially significant in this respect, but the insects, on account of their numbers, afford great opportunity for discovery. Anyone who has studied the geographical history of a fauna comes to see in the existing biota a number of groups of different age. Some have evolved in comparatively recent times, others are extremely ancient. Some had their origin at or near the place on which we find them, others migrated from the other side of the earth. Thus a mere faunal list, at first sight so lacking in interest, takes on dramatic features and contributes to our understanding of the philosophy of nature.

It may perhaps be disappointing to some to find that the great work of exploration and investigation carried on by the Academy does not seem to lead us nearer to the completion of our tasks. Instead of that it opens up new vistas which lead us on and on to a land that no man knows. We should be happy that it is so, and in the assurance that the door of opportunity for significant scientific research cannot be closed in the Pacific Coast region for an incalculable period. Or, rather, it cannot be closed so long as we care to keep it open by our labors and material support.—T. D. A. Cockerell.